Homework: Ch. 20

1. How is the direction of current flow defined in a conductor? How does this compare to the actual flow?

2. For each quantity below, record the abbreviation, the SI unit, and the unit abbreviation.

Quantity	Quantity Abbreviation	SI unit	Unit Abbreviation
Potential Difference			
Electric Field			
Charge			
Capacitance			
Resistance			
Current			

3. A resistor of 3.00 Ω is connected in a circuit to a battery of 2.00 V. What is the current in the circuit? If you know insert a 6.00 V battery into the circuit, what resistance would you need to produce the same amount of current?

4. A common flashlight bulb is rated at 0.300 A and 2.90 V. If the resistance of the tungsten bulb filament at room temperature (20.0 ˚C) is 1.10 Ω, what is the temperature of the filament when the build is on?

5. When 115V is applied across a wire that is 10.0 m long and has a 0.30 mm radius, the magnitude of the current 1.4×10^4 A. Find the resistivity of the wire.

6. An electrical cable consists of 125 strands of fine wire, each having 2.65 μΩ resistance. The same potential difference is applied between the ends of all the strands and results in a total current of 0.750 A.
    a. What is the current in each strand?
    b. What is the applied potential difference?

7. A 120.0 V potential difference is applied to a space heater whose resistance is 14.0 Ω when hot. At what rate is electrical energy transferred to thermal energy?

8. An unknown resistor is connected between the terminals of a 3.00 V battery. Energy is dissipated in the resistor at a rate of 0.540 W. The same resistor is then connected between the terminals of a 1.50 V battery. At what rate is the energy now dissipated?

9. A steel trolley car rail has a cross-sectional area of 56.0 cm^2. What is the resistance of a 10.0 km long rail? Assume that the resistivity of the steel is 3.00×10^{-7} $\Omega \cdot m$.

10. A Nichrome heater dissipates 500.0 W when the applied potential difference is 110 V and the wire temperature is 800.0 °C. What would be the dissipation rate if the wire's temperature were held at 200.0 °C? Assume that $\alpha = 4.0 \times 10^{-4}$ for Nichrome at 800.0 °C.